Economics and Human Biology 23 (2016) 136–148

Contents lists available at ScienceDirect

Economics and Human Biology

journal homepage: www.elsevier.com/locate/ehb

Intergenerational persistence of health: Do immigrants get healthier as they remain in the U.S. for more generations?☆

Mevlude Akbulut-Yuksel[a], Adriana D. Kugler[b,*]

[a] Dalhousie University and IZA, Canada
[b] Georgetown University, NBER, CEPR and IZA, United States

ARTICLE INFO

Article history:
Received 1 February 2016
Received in revised form 21 July 2016
Accepted 29 August 2016
Available online 6 September 2016

JEL C

ABSTRACT

It is well known that a substantial part of income and education is passed on from parents to children, generating substantial persistence in socioeconomic status across generations. In this paper, we examine whether another form of human capital, health, is also largely transmitted from generation to generation. Using data from the NLSY, we first present new evidence on intergenerational transmission of health outcomes in the U.S., including weight, height, the body mass index (BMI), asthma and depression for both natives and immigrants. We show that between 50% and 70% of the mothers' health status persists in both native and immigrant children, and that, on average, immigrants experience higher persistence than natives in BMI. We also find that the longer immigrants remain in the U.S., the less intergenerational persistence there is and the more immigrants look like native children. Unfortunately, the more generations immigrant families remain in the U.S., the more children of immigrants resemble natives' higher BMI.

1. Introduction

Even in a society that is considered highly mobile like the United States, it is well established that socioeconomic status is largely determined by parental income. Several studies have shown that the income of both natives and immigrants is highly associated with the income of their parents (Chetty et al., 2014; Solon, 1992; Zimmerman, 1992; Borjas, 1992), pointing to a high level of persistence in socioeconomic status and limited opportunities for social mobility. These studies, however, have not decomposed the estimated intergenerational income associations into different components. Such decomposition would help to identify factors that promote or delay mobility and also identify possible policies to promote upward social mobility. Human capital theory suggests that education and health are key endowments affecting intergenerational transmission of economic status and earnings (Behrman et al., 1994).

While a substantial literature focuses on the intergenerational transmission of education, much less work has focused on the intergenerational transmission of health. A growing literature has shown that aside from education, health status such as height (Persico et al., 2004; Case and Paxson, 2008), obesity (Oreffice and Quintana-Domeque, 2016; Garcia and Quintana-Domeque, 2007; Cawley, 2004), and health conditions (Currie and Madrian, 1999) are also important determinants of earnings differentials. Health capital is an important component of an individual's stock of human capital affecting labor market outcomes (Mushkin, 1962; Grossman, 1972; Currie and Madrian, 1999). The literature on intergenerational transmission of socioeconomic outcomes has so far focused almost exclusively on cognitive skills and investments in education. Just as importantly, intergenerational persistence in non-cognitive attributes, including individual's physical and mental health, may also provide important insights in understanding high persistence in economic status.

The objective of this paper is to examine the extent of intergenerational transmission in health outcomes including weight, height, the body mass index (BMI), asthma and depression.[1] We investigate these intergenerational associations separately for natives and immigrants from different generations. We address two questions about the intergenerational transmission of

☆ We are grateful to George Akerlof, Janet Currie, Caroline Hoxby, Climent Quintana-Domeque, Erdal Tekin, Mutlu Yuksel and to seminar participants at the NBER Children's Spring meetings, the University of Houston, IZA, the Canadian Economists Study Group, and at the Royal Economic Society Conference in Warwick for helpful comments.

* Corresponding author.
E-mail addresses: mevlude@dal.ca (M. Akbulut-Yuksel), Adriana.Kugler@georgetown.edu (A.D. Kugler).

http://dx.doi.org/10.1016/j.ehb.2016.08.004
1570-677X/

[1] BMI is defined as weight measured in kilograms divided by the square of height measured in meters.

health status. First, we examine the extent of the intergenerational transmission of health for natives and immigrants and ask whether these intergenerational associations differ between natives and immigrants. Second, we investigate whether those who have been in the U.S. for various generations have lower intergenerational persistence in health outcomes compared to more recent immigrants. Related to this previous point, we ask whether immigrants resemble natives more in terms of health outcomes as they stay in the United States for more generations.

To answer these questions, we use a nationally representative data set, the National Longitudinal Survey of Youth (NLSY), which follows mothers from 1979 through 2004 and their children who are older than 15 from 1994 through 2004. The fact that the NLSY follows mothers and children through time enables us to link mothers' and children's health outcomes and demographic characteristics and observe both generations at the same stage of their lives. In addition, we are able to link sibling mothers and their children in our data, which allows us to compare the health outcomes of cousins, thus controlling for grandparents' fixed effects and accounting for many prominent genetic and environmental attributes that are common in a family tree.

To preview our main results, we find that both native and immigrant children attain an important fraction of their health capital from their mothers. We further show that mothers' health outcomes contribute to generate persistence across generations both in terms of anthropometric measures–weight, height and BMI–as well as specific conditions, such as asthma, and emotional health outcomes, such as depression. This remains true even when we introduce a rich set of controls for children's and mothers' characteristics and grandparents' fixed effects. We find that the persistence of BMI is higher for immigrant children than for native children. In addition, we find that the longer immigrants remain in the U.S. the smaller the persistence coefficient in health status is and the less their health status is determined by their mothers'. In particular, we find less persistence in BMI for the third-generation immigrant children than for second and first generation immigrant children. However, this also means that the longer immigrant families remain in the U.S., the more their children resemble native children in their propensity to be overweight.

The remainder of the paper is organized as follows. Section 2 reviews the previous literature on intergenerational persistence of socioeconomic status. Section 3 lays out the main empirical strategy and Section 4 describes the data. Section 5 presents the main results using Ordinary Least Squares (OLS) for natives and immigrants as well as the OLS results with averages of mothers' health status. Section 6 concludes.

2. Literature review

An extensive literature now exists establishing that individual health is an important component of labor market success. For instance, the effects of obesity on labor market outcomes have been analyzed in a large number of studies in the U.S. and Europe. One of the most robust findings is that U.S. obese women tend to earn less than their non-obese counterparts and there are differences by ethnicity and race (Cawley, 2004). However, results are not as robust for Europe (Oreffice and Quintana-Domeque, 2016; Garcia and Quintana-Domeque, 2007). On the other hand, using Norwegian data, Black et al. (2007) find that lower birth babies have worse outcomes both in the short-run in terms of one-year mortality rate and in the longer-run in terms of educational attainment and earnings. Other studies also examine the relation between height and earnings and document that a person's height is strongly correlated with his or her income. Judge and Cable (2004), Persico et al. (2004) and Case and Paxson (2008) find similar results and report that for both men and women an additional inch of height is associated with a one to two percent increase in earnings in the United States. Taken together, these studies suggest that labor markets generally reward height and penalize obesity and low birth weight.

Given this widely documented relationship between health and socioeconomic outcomes, the intergenerational transmission of health status can be an important factor contributing to the intergenerational persistence of economic status and income. Yet, while a number of studies examine the degree of intergenerational mobility in earnings and economic status (Chetty et al., 2014; Yuksel, 2007; Ferrie, 2005; Corak, 2004; Solon, 1992; Zimmerman, 1992), few studies have attempted to investigate the intergenerational transmission of health outcomes. The intuition that individuals' health along with their education endowments may provide important insights in understanding persistence in earnings was first argued by Ahlburg (1998).

Coneus and Spiess (2012) and Eriksson et al. (2005) are among the few studies that analyze the intergenerational transmission of health outcomes including anthropometric measures, health disorders, and self-reported health measures. Coneus and Spiess (2012) use the German Socio-Economic Panel and find a significant association between parental health and child health during the first three years of life, even after controlling for parental income, education and family composition. Eriksson et al. (2005) examine data from the Danish Youth Cohort Study and show that the intergenerational persistence of health such as back illness, heart disease, and psychological illness prevails into adulthood.

Several studies examine the intergenerational transmission in birth weight and body mass index (BMI). Emanuel et al. (1992) and Collins et al. (2002) find a positive association between infants' and parents' birth weights using the 1958 British Birth Cohort Study and Illinois Vital Statistics, respectively. Currie and Moretti (2007) revisit the same question using individual birth records from California. They find a substantial intergenerational transmission in the incidence of low birth weight. Moreover, they find that this persistence is higher among children and mothers from high poverty zip codes. Classen (2010) and Dolton and Xiao (2015) instead examine the intergenerational association in BMI. These studies show that there is a significant intergenerational transmission of BMI in the United States and China, respectively. Both papers find that this intergenerational association is stronger at higher levels of BMI, but Dolton and Xiao (2015) find that this association becomes weaker as children get older in China.

Our study also relates to the literature examining the association between mother's socioeconomic status and children's health. This strand of the literature has shown that mothers' educational attainment is strongly associated with infants' birth weight both in U.S. and in developing countries (Strauss and Thomas, 1995, for developing countries; Currie and Moretti, 2003, for the U.S.). These studies find that mothers who are more educated are less likely to have low or very low birth weight babies, and that their babies are less likely to die within their first year of life. Other studies also find that these effects persist well into adulthood. For example, Case et al. (2005) shows that mothers' education predicts self-reported health at age 42. In line with this research, in this paper we also investigate the association between mother's SES and children's health outcomes.

Our study is also related to the studies on immigrant health and their subsequent health trajectories in the host country. It is widely documented that immigrants have better health status, lower mortality rates and lower prevalence of chronic health conditions compared to their native counterparts with the same socioeconomic status (Baker et al., 2015; Antecol and Bedard, 2006; Jasso et al., 2004; Stephen et al., 1994). However, these health advantages dissipate, as immigrants remain longer in the host country due to increased acculturation, repeated exposure of

immigrants to prejudice and discrimination and the direct psychological impacts of the migration process itself (Jasso et al., 2004; Elo et al., 2008). Antecol and Bedard (2006), for instance, find that female immigrants resemble their native counterparts in terms of average BMI after a decade in the U.S., while male immigrants experience an increase in their BMI but not fully converge to their native counterparts.[2] Akresh (2007) and Frank and Akresh (2013) show that particularly poor individuals from less-developed countries are at higher risk because of behavioral responses changing their diets and because of the existing negative relation between SES and BMI.

This paper contributes to these various strands of the literature by examining the extent to which health endowments are transmitted across generations for both immigrants and natives. We are not aware of any study that investigates the intergenerational transmission in health outcomes including height, weight, BMI, asthma and depression. Moreover, to the best of our knowledge, our study is the first to compare the intergenerational persistence in health outcomes across natives and immigrants of various generations.

3. Estimation framework

In this study, we examine the similarity in health outcomes between mothers and children using the following regression,

$$H_{1i} = \rho H_{0i} + \beta X_{1i} + \varepsilon_{1i} \quad (1)$$

where H_{1i} is child health outcomes including weight, height, BMI, asthma and depression; H_{0i} is the health outcomes of mother; X_{1i} includes all other characteristics of the mother's generation that affect children's health outcomes as well as the child characteristics; and ε_{1i} is a random shock. This equation should be regarded as a reduced-form equation, where ρ is determined by multiple factors containing genetic and behavior attributes transmitted from mothers to children. In this setting, H_{0i} controls for all of the factors that affected the mother's health outcomes, while X_{1i} will include additional characteristics of the mother that affects the children's health outcomes.

The coefficient ρ measures the degree of persistence in health outcomes and is the fraction of the mother's health status that her child inherits. Estimates of ρ close to unity imply high persistence across generations whereas values of ρ close to zero suggest low persistence in health outcomes. Generally, we can expect to find coefficients between zero and one. Most empirical studies in the intergenerational persistence of earnings and education between father-son pairs find ρ to lie between zero and one, although a few studies investigating the mobility of economic status between father-daughter and mother-daughter pairs have found negative estimates of ρ.[3]

We begin with models estimating the direct association between mother's health and children's health outcomes, turning afterwards to models that incorporate controls for the child's sex, child's and mother's race and age to control for potential racial and age differentials. Ignoring variables such as mother's total household income, educational attainment, marital status, and type of residence and unemployment rate in the region of residence when the mother was first interviewed that might be correlated with children's health may yield upwardly biased estimates of ρ. Therefore, to address the potential omitted variables problem, we introduce these additional controls to Eq. (1). One may expect the persistence coefficient to fall as we include more controls to the model.

In addition, similar to Currie and Moretti (2007), we also re-estimate Eq. (1) including grandparents' fixed effects. Grandparents' fixed effects enable us to assess the effect of mother's health outcomes on children's health outcomes, exploiting variation between children of sisters that have at least one and generally two common parents. Including grandparents' fixed effects allows us to control for genetic traits, mother's background characteristics as well as the family environment when the mother was growing up. While we report models with grandparent fixed effects, these models only include 1782 pairs of native sisters and 445 pairs of immigrant sisters so the estimates are much less precisely estimated in these specifications.

A potentially important limitation in estimating Eq. (1) is that health variables are self-reported, which raises the issue of measurement error. In addition, mother's health outcomes may be subject to transitory shocks leading to a downward bias in estimates due to classical measurement error in mother's health outcomes. Following the literature on intergenerational transmission of economic status (Solon, 1992; Zimmerman, 1992), we attempt to reduce the bias due to classical measurement error by averaging mother's health outcomes over multiples years.[4]

4. Data description

The empirical analysis relies on two data sets that allow us to examine the degree of intergenerational transmission of health status for both natives and immigrants in the U.S. First, we use the National Longitudinal Survey of Youth 1979 (NLSY79) for the mothers' generation. The NLSY79 provides detailed information on mothers' health outcomes, individual and household characteristics, and the childhood environment the mothers grew up in. The NLSY79 is a nationally representative dataset, which includes all eligible individuals aged 14–21 residing in a surveyed household at the end of 1978 as respondents. As a result, the 11,406 civilian respondents were interviewed in 1979 originated from 7490 unique households; 2862 households included more than one NLSY79 respondent, consisting of 5914 siblings.

For the children's generation, we use the Children of NLSY79 data. The Children of NLSY79 is nationally representative dataset, which includes all biological children born to female NLSY79 respondents who are living in the United States in 1978. Starting in 1994, NLSY79 children who were 15 years old or older by the end of the interview year were interviewed separately as young adults. We utilize the Young Adult File in our analysis and focus on these young adults.

The NLSY79 and the Children of NLSY79 Young Adult File have information on both mothers' and children's self-reported weight, height, BMI, and prevalence of asthma and depression. Both datasets also provide information on a battery of individual and household characteristics such as race, sex, age, migration status, marital status, total household income, and whether the mother and child live in an urban area as well as the unemployment rate in the region of residence in the first year the mother was interviewed. Essential for the purpose of this paper, we are able to link mothers' health outcomes as well as their demographic data to their children's health outcomes and demographic data at the same point in their life cycle, which is not possible in most of the available data.

We first estimate the intergenerational persistence in anthropometric measures such as weight, height and body mass index (BMI). This measure has particular importance in the epidemiology

[2] Akresh and Frank (2008) find similar results for self-reported health measures among new immigrants.

[3] Presumably, any real number could be obtained from the estimation of Eq. (1); a negative value of ρ would refer to a situation where mothers are high in their generations' distribution of health, while their children tend to be low in their own generations' distribution.

[4] Alternatively, one could use an instrumental variable approach to address the measurement error in health outcomes.

and medical literatures, as it reflects both height and weight of the individual and is known as a standard measure of fatness and obesity (Oreffice and Quintana-Domeque, 2016; Cawley, 2004). As explained in Section 5, however, BMI fails to distinguish muscularity from obesity (Burkhauser and Cawley, 2008; Wada and Tekin, 2010). Despite these limitations, BMI is still widely used as a proxy for body fat and obesity in medicine and epidemiology because it is easy to calculate since weight and height are often reported in surveys (Wada and Tekin, 2010).

In addition to anthropometric health measures, we also examine the intergenerational persistence in asthma and depression. The NLSY reports whether mothers and/or children were ever diagnosed with asthma by a doctor, nurse or other health professional for the first time in 2004. Using this information, we define mothers' and children's asthma status as a dummy variable, which takes a value of one if the mother and the child, were ever diagnosed with asthma and zero otherwise. Similarly, we define depression as an indicator that equals one if the respondent reported to have experienced depression sometimes, a moderate amount of time or most of the time during the past week and zero otherwise.

Our analysis is primarily conducted using 3955 mother-children pairs for natives and 916 for immigrants. We include all NLSY79 female respondents that have a child in Children of the NLSY79 Young Adult File and who have non-missing information on health outcomes between 1981 and 1994. Similarly, for the children's generation, we include all children in 2004, who have information on their own health outcomes and can be linked to their mothers. For most of the analysis, we focus on the earliest observational date for mothers' health outcomes (1981) and the latest observational date for children's health outcomes (2004). An exception are the observational dates used for asthma and depression for mothers. We only have information about the incidence of depression for mothers as early as 1992. Thus, we use information from 1992 for mothers and from 2004 for children when the outcome of interest is depression. Moreover, we only have information on the incidence of asthma for mothers in 2004, so we examine the association between the incidence of asthma for mothers and children in the same year.

Table 1 presents descriptive statistics for the young adult sample for natives and immigrants from different generations, respectively. In this and subsequent tables, first, second and third generation immigrants refer to the children's generation. NLSY79 also includes information about the birthplace of the children, of the mother, of the grandparents (i.e., the parents of the mother) and of the great grandfather (i.e., the grandfather of the mother). More specifically, we define a first generation immigrant as an immigrant who was him/herself born in the U.S. but whose mother, grandparents and great grandfather were born outside of

Table 1
Means and Standard Deviations for Young Adults.

	All	Natives	Immigrants			
			All	1st Gen.	2nd Gen.	3rd Gen.
	(1)	(2)	(3)	(4)	(5)	(6)
Weight (in pounds)	158.388	159.708	152.695	150.742	151.321	156.286
	(40.570)	(40.570)	(37.732)	(34.203)	(35.543)	(43.110)
Height (in inches)	67.048	67.155	66.589	66.386	66.281	67.102
	(4.125)	(4.143)	(4.017)	(3.998)	(3.864)	(4.121)
BMI	24.739	24.872	24.165	24.065	24.184	24.273
	(5.557)	(5.659)	(5.058)	(4.608)	(4.958)	(5.644)
Depression	0.288	0.295	0.260	0.259	0.271	0.252
	(0.453)	(0.456)	(0.439)	(0.438)	(0.445)	(0.434)
Asthma in 2004	0.176	0.175	0.180	0.150	0.213	0.188
	(0.381)	(0.380)	(0.385)	(0.357)	(0.410)	(0.392)
Age	18.648	18.711	18.376	18.443	18.362	18.303
	(3.490)	(3.523)	(3.330)	(3.292)	(3.358)	(3.356)
Female	0.488	0.487	0.493	0.477	0.487	0.517
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
White	0.456	0.438	0.533	0.418	0.573	0.648
	(0.498)	(0.496)	(0.499)	(0.493)	(0.495)	(0.478)
Black	0.389	0.461	0.082	0.074	0.090	0.086
	(0.488)	(0.498)	(0.275)	(0.262)	(0.287)	(0.280)
Hispanic	0.224	0.132	0.615	0.799	0.630	0.360
	(0.417)	(0.339)	(0.487)	(0.401)	(0.483)	(0.480)
American Indian	0.014	0.014	0.010	0.006	0.006	0.020
	(0.116)	(0.119)	(0.102)	(0.078)	(0.077)	(0.140)
Asian\ Pacific Islander	0.004	0.002	0.010	0.018	0.003	0.004
	(0.062)	(0.049)	(0.097)	(0.133)	(0.057)	(0.061)
Other race	0.091	0.056	0.238	0.307	0.215	0.168
	(0.287)	(0.231)	(0.426)	(0.462)	(0.411)	(0.374)
N max.	19,165	15,541	3,624	1,484	998	1,142

Note: First, second and third generations refer to the children's generation. Means and standard deviations in parentheses are presented for children's generation.

the U.S. The second-generation immigrant children are those who were themselves born in the U.S, their mothers were born in the U.S. and either of their grandparents was born outside the U.S. and whose great grandfather was born outside of the U.S. We classify children as third generation immigrants if they were themselves born in the U.S., and their mothers and their grandparents were born in the U.S., but their great grandfather was born outside of the U.S.

Table 1 shows that natives are heavier, taller, have higher BMI and are more likely to report being depressed compared to immigrants from all generations. However, column (6) in Table 1 shows that third-generation immigrant children look similar to natives in terms of health outcomes. Focusing on third generation immigrant children, we see that they are heavier, taller, have higher BMI and are more likely to have asthma than first and second generation immigrant children, although weight, BMI and depression differences are significant.

Table 2 reports summary statistics of mothers separately for natives and immigrants. Similar to children's generation, native mothers are also heavier, taller, have higher BMI and are more likely to be diagnosed with asthma and depression relative to immigrant mothers. In addition, native mothers have more years of schooling and higher total household income compared to zero and first generation immigrant mothers (i.e., the mothers of first and second-generation immigrant children). On the other hand, second generation immigrant mothers (i.e., the mothers of third generation immigrant children) look very similar to natives in terms of both health outcomes and household characteristics such as years of education, total household income and marital status in 1979.

Comparing the age of children and mothers in Tables 1 and 2 shows that the mean age for both children and mothers is 19 years of age. This enables us to compare the health outcomes of mothers and children at around the same stage of their life cycle. This, thus, helps us to avoid any potential issues that may arise due to age differentials across generations.

Table 2
Means and Standard Deviations for Mothers.

	All	Natives	Immigrants			
			All	1st Gen.	2nd Gen.	3rd Gen.
	(1)	(2)	(3)	(4)	(5)	(6)
Weight (in pounds)	129.178	129.869	126.476	124.228	125.507	129.630
	(22.364)	(22.657)	(20.967)	(18.867)	(20.642)	(22.875)
Height (in inches)	64.024	64.177	63.419	63.070	63.382	63.808
	(2.717)	(2.707)	(2.672)	(2.690)	(2.839)	(2.450)
BMI	22.217	22.228	22.173	22.037	22.062	22.405
	(3.648)	(3.714)	(3.374)	(3.027)	(3.573)	(3.527)
Depression	0.382	0.387	0.362	0.408	0.387	0.285
	(0.486)	(0.487)	(0.481)	(0.492)	(0.487)	(0.452)
Asthma in 2004	0.134	0.136	0.126	0.092	0.166	0.128
	(0.341)	(0.343)	(0.332)	(0.289)	(0.372)	(0.334)
Age	19.811	18.787	18.959	19.187	18.474	19.135
	(2.263)	(2.408)	(2.379)	(2.369)	(2.370)	(2.337)
Non-Black, Non-Hispanic	0.531	0.563	0.410	0.211	0.350	0.680
	(0.499)	(0.496)	(0.492)	(0.408)	(0.477)	(0.466)
Black	0.277	0.332	0.065	0.095	0.062	0.035
	(0.447)	(0.471)	(0.246)	(0.293)	(0.241)	(0.184)
Hispanic	0.192	0.105	0.525	0.694	0.588	0.285
	(0.394)	(0.307)	(0.499)	(0.461)	(0.492)	(0.451)
Years of Education in 1979	10.331	10.381	10.135	9.339	10.210	10.944
	(2.039)	(1.934)	(2.393)	(2.797)	(1.947)	(1.935)
Total Household Income in 1979	16.268.09	16,210.360	16.485.22	14.551.93	15.007.83	19.920.88
	(12675.76)	(12931.61)	(11662.42)	(10331.92)	(11410.39)	(12387.57)
Married in 1979	0.183	0.180	0.194	0.253	0.174	0.147
	(0.386)	(0.384)	(0.396)	(0.435)	(0.379)	(0.354)
Urban at age 14	0.793	0.776	0.858	0.870	0.837	0.862
	(0.405)	(0.417)	(0.349)	(0.336)	(0.369)	(0.345)
Unemp. Rate in Region in 1979	6.151	6.102	6.335	6.315	6.329	6.364
	(2.235)	(2.117)	(2.627)	(2.548)	(2.731)	(2.620)
N max.	34,284	27,174	7110	2628	2091	2391

Note: Data is taken from National Longitudinal Survey of Youth. First, second and third generations respectively. Data is taken from National Longitudinal Survey of Youth. First, second and third generations refers to the children's generation and correspond to zero, 1st and 2nd generations of the mothers, respectively. Means and standard deviations in parentheses are presented for mothers' generation. Means and standard deviations in parentheses are presented for mothers' generation.

5. Results on intergenerational transmission of health status

This section presents estimates of intergenerational mobility in health outcomes using measures of health including weight, height, BMI, asthma and depression.

5.1. Intergenerational persistence in weight, height and BMI

All OLS estimations involving weight, height and BMI are conducted using 1981 information for the mothers' generation and 2004 information for the children's generation. We choose these years to eliminate age-related differences in health outcomes. As indicated above, the mean age for mothers and children is approximately 19 for mothers in 1981 and for children in 2004.

5.1.1. Intergenerational transmission of weight

We begin the empirical analysis with an examination of the association between mother's weight and child's weight. Results are reported in Panel A of Table 3, separately for children of native-born and immigrant mothers. Columns (1) and (4) show estimations from models without controls for children of natives and immigrants, respectively. These estimates can be interpreted as 50% of the mother's weight is transmitted to her children for natives and 70% to immigrant children. Although, we observe a lot of persistence in terms of weight across generations for both natives and immigrants, comparing the persistence coefficient between natives and immigrants indicates that the persistence is significantly greater for immigrants (p-value of 0.04). In columns (2) and (5), we control for children's characteristics by including children's sex, race and, in particular, by including both the child's and mother's age to account for the fact that health outcomes may be sensitive to a person's age. To illustrate, the coefficient estimate in column (2) drops by 7.6 % for natives and by 18.1% for immigrants mainly due to the gender and racial differentials in weight outcomes. In addition, once we control for children's characteristics, the persistence coefficient is no longer significantly different between natives and immigrants. This finding suggests that the differences in the racial composition of natives and immigrants might lead to a substantial difference in intergenerational persistence of weight.

The mother's weight may be correlated to her socioeconomic status and this may be driving the weight of the child. In order to control for this possibility, we estimate models including additional controls for mother's background characteristics such

Table 3
Intergenerational Transmission of Anthropometric Measures.

	Children of Native-Born			Children of Immigrants		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Child's Weight						
Mother's Weight	0.499[c]	0.461[c]	0.429[c]	0.706[c]	0.578[c]	0.488[c]
	(0.040)	(0.040)	(0.056)	(0.090)	(0.087)	(0.089)
Low Income Quantile			2.068			−3.076
			(2.697)			(4.001)
Mother's Education			−2.409[b]			−1.308
in 1979			(1.022)			(1.110)
Married in 1979			−2.705			−15.145[b]
			(10.540)			(5.927)
R^2	0.077	0.283	0.244	0.153	0.402	0.385
N	3921	3508	2068	914	850	488
p-value for diff. btw. natives and immigrants				0.0363	0.2168	0.5720
Panel B: Child's Height						
Mother's Height	0.404[c]	0.421[c]	0.393[c]	0.471[c]	0.466[c]	0.387[c]
	(0.031)	(0.024)	(0.029)	(0.067)	(0.060)	(0.074)
Low Income Quantile			0.093			−0.020
			(0.179)			(0.398)
Mother's Education			0.083			0.083
in 1979			(0.088)			(0.124)
Married in 1979			0.463			−0.163
			(0.601)			(0.566)
R^2	0.062	0.56	0.547	0.09	0.556	0.541
N	3955	3539	2087	916	852	488
p-value for diff. btw. natives and immigrants				0.3619	0.4780	0.9397
Panel C: Child's BMI						
Mother's BMI	0.449[c]	0.392[c]	0.383[c]	0.578[c]	0.465[c]	0.538[c]
	(0.032)	(0.035)	(0.051)	(0.072)	(0.064)	(0.081)
Low Income Quantile			0.315			−0.386
			(0.401)			(0.654)
Mother's Education			−0.440[c]			−0.280
in 1979			(0.155)			(0.183)
Married in 1979			−0.906			−2.437[c]
			(1.573)			(0.939)
R^2	0.092	0.164	0.158	0.157	0.227	0.255
N	3899	3487	2052	897	835	479
p-value for diff. btw. natives and immigrants				0.1033	0.3142	0.0999
Child's Age, Sex and Race		Yes	Yes		Yes	Yes
Household Characteristics			Yes			Yes

Notes: Standard error are reported in parenthesis. Standard errors are clustered at the family level. Household characteristics include: mother's race, total household income, and marital status, urban area residence and unemployment rate in the current residence for the first year in which the mother was interviewed. Each column is from a separate regression using 1981 for mothers and 2004 for young adults. Each regression is weighted using the 2004 Young Adult Weights.

[b] = 0.05.

[c] = 0.01.

as total household income, years of education, and marital status, and the unemployment rate in the area of residence and whether the mother lived in an urban area in 1979. Columns (3) and (6) contain corresponding estimates for persistence of weight across generations introducing controls for mother's background characteristics.[5] Although the estimated coefficients on mother's weight are somewhat reduced after we account for mother's background characteristics, we still observe a lot of persistence in weight across generations for both natives and immigrants. We find that immigrant children inherit 49% of their mothers' weight while native children inherit 43% of the mother's weight, after we control for both children's and mothers' characteristics, although the difference in persistence between immigrant and native children is not significant.

Our results in column (3) also show that the educational attainment of the mother is strongly associated with the weight of native children. More specifically, every additional year of mother's education is associated with 2.41 pounds decrease in child's weight in 2004 in the native sample. Column (6) also provides evidence suggesting that the educational attainment is negatively associated with immigrant children's weight, though the small sample makes it harder to detect this effect. Interestingly, immigrant children of married mothers tend to be 15 pounds thinner compared to children of single mothers indicating that the negative association between single motherhood and weight is stronger for immigrant than native children. Moreover, in contrast to previous studies examining the extent of the intergenerational transmission of birth weight (Currie and Moretti, 2007, 2003), we find that other background characteristics of mothers, including being in low income quartile and unemployment rate in the region of residence, are not related to native and immigrant children's health outcomes.

Finally, in Table A2, we present models including grandparents' fixed effects for natives and immigrants, respectively. This specification takes advantage of variation in health outcomes of cousins as an only source of variation, and therefore controls for many permanent unobserved factors such as common genetic factors and mothers' childhood environment. In addition to grandparents' fixed effects, we also control for children's gender, race and age in this analysis to account for potential racial and gender differences across cousins. Our grandparents' fixed effects analysis is primarily conducted using 1782 mother sibling pairs for natives and 445 mother sibling pairs for immigrants. Admittedly, standard errors increase substantially due to the reduction in sample size; nonetheless, the point estimates on mother's weight remain quantitatively similar and statistically significant for natives in these models. Similarly, grandparents' fixed effects analysis yields positive and strong intergenerational persistence in weight among immigrants; however, the sample size for this group is too small to yield precise estimates. Thus, grandparents fixed effects analysis shows that the effects of mother's health status on children's health status remain large even after controlling for genetic factors and mothers' childhood environment.

5.1.2. Intergenerational transmission of height

The height of the population reflects both its genetic endowment and its long-run nutritional intake and health status (Bozzoli et al., 2009; Silventoinen, 2003; Fogel, 1992). Thus, a child's height is determined by combination of genetic endowments as well as environmental factors such as nutrition and disease load and the socioeconomic status of the family (Bozzoli et al., 2009; Steckel, 1995). To explore the extent to which a mother's height is transmitted to her children, we estimate intergenerational transmission models for height as well. The persistence coefficients of height are displayed in Panel B of Table 3 separately for native and immigrant children. The coefficient estimates on mother's height reveal a lot of persistence in terms of height across generation as well, though the persistence in height is slightly less compared to persistence in weight across different specifications. Columns (1) and (4) of Panel B show that native children attain 40% of their height from their mothers, whereas the corresponding association for children of immigrants is 47%.

Although children of immigrants are somewhat more likely to inherit their mothers' height, the persistence coefficient is not significantly different between native and immigrant children. Columns (2), (3), (5) and (6) of Panel B show the persistence coefficient in height by sequentially introducing the variables discussed above. Including more controls for both children's characteristics as well as mothers' backgrounds leads the persistence coefficient to fall in almost all specifications.[6] Additionally, in contrast to child's weight, it seems that mother's socioeconomic status in general does not seem to be associated with height of native and immigrant children. In column (2) of Table A2, we also present the estimates obtained using grandparents' fixed effects. This analysis clearly notes that a large fraction of the mother's height is transmitted to her child, even when we control for genetic traits, children's and mother's background characteristics.

5.1.3. Intergenerational transmission of BMI

In addition to weight and height, we also consider the magnitude of the intergenerational persistence in the body mass index (BMI). BMI reflects both height and weight of the individual and is widely used as a measure of fatness and obesity in epidemiology and medicine (Oreffice and Quintana-Domeque, 2016; Cawley, 2004). As pointed out in Burkhauser and Cawley (2008) and Wada and Tekin (2010), however, BMI does not account for body composition, and fails to distinguish fat from muscle. Despite these limitations, BMI is still extensively used as a proxy for body fat and obesity in medicine and epidemiology since body fat is not directly observable to physicians and researchers, while height and weight are more easily measured and more widely reported in surveys.

Panel C of Table 3 provides the ordinary-least-squares estimates of the persistence coefficients for BMI. The results demonstrate that mother's BMI is transmitted to her child, suggesting that there is a great deal of intergenerational transmission across generations even when we incorporate more precise measures of health. From Panel C, the baseline specification indicates that children of native mothers attain 45% of their mothers' BMI, while children of immigrant mothers inherit 58% of their mothers' BMI. The immigrant persistence coefficient is higher than the natives and significant at the 10% level.[7]

Importantly, the results controlling for mother's characteristics continue to show greater persistence for immigrants than natives (p-value of 0.099). In addition, models accounting for mother's background characteristics show that educational attainment of mothers is negatively associated and the unemployment rate is positively associated with natives children's BMI but not with immigrant children's BMI. By contrast, single motherhood significantly increases immigrant children's BMI but not native

[5] Information on mother's educational attainment and total household income is not available for some respondents; therefore sample size decreases in this specification. Table A1 shows results for columns (1) and (2) and columns (4) and (5) using the same number of observations as column (3) and column (6), respectively, and the coefficients are often smaller when using these samples.

[6] Table A1 shows results for columns (1) and (2) and columns (4) and (5) using the same number of observations as column (3) and column (6), respectively, and the coefficients are often smaller when using these samples.

[7] Focusing on mother's weight and child's birth weight in the Unites States, Yan (2015) also finds that mothers who were overweight or obese before conception and mothers who experienced excessive weight gains during pregnancy are more likely to give birth to a high birth weight babies.

Table 4
Intergenerational Transmission of Health with Averages.

	Children of Native-Born			Children of Immigrants		
	1-Year (1)	2-Years (2)	3-Years (3)	1-Year (4)	2-Years (5)	3-Years (6)
Panel A: Child's Weight						
Mother's Weight	0.422[c]	0.437[c]	0.454[c]	0.481[c]	0.465[c]	0.402[c]
	(0.058)	(0.060)	(0.057)	(0.091)	(0.102)	(0.103)
Low Income Quartile	2.263	2.176	2.273	−3.161	−3.496	−4.032
	(2.747)	(2.735)	(2.735)	(4.311)	(4.299)	(4.378)
Mother's Education	−2.493[b]	−2.424[b]	−2.243[b]	−1.426	−1.281	−1.258
in 1979	(1.041)	(1.016)	(1.004)	(1.153)	(1.163)	(1.192)
Married in 1979	−2.707	−3.147	−2.927	−15.944[b]	−13.923[b]	−12.469[a]
	(10.473)	(10.632)	(10.672)	(6.532)	(6.876)	(7.001)
R^2	0.245	0.247	0.255	0.382	0.378	0.371
N	2007	2007	2007	462	462	462
p-value for diff. btw. natives and immigrants				0.5790	0.8128	0.6537
Panel B: Child's Height						
Mother's Height	0.393[c]	0.418[c]	0.424[c]	0.388[c]	0.435[c]	0.446[c]
	(0.030)	(0.030)	(0.029)	(0.077)	(0.083)	(0.083)
Low Income Quartile	0.124	0.123	0.127	−0.007	−0.031	−0.026
	(0.183)	(0.180)	(0.179)	(0.416)	(0.407)	(0.404)
Mother's Education	0.079	0.077	0.075	0.104	0.102	0.101
in 1979	(0.089)	(0.091)	(0.091)	(0.128)	(0.128)	(0.128)
Married in 1979	0.496	0.455	0.486	−0.049	0.048	0.072
	(0.601)	(0.602)	(0.607)	(0.579)	(0.570)	(0.571)
R^2	0.545	0.549	0.551	0.543	0.548	0.550
N	2041	2041	2041	467	467	467
p-value for diff. btw. natives and immigrants				0.9572	0.8486	0.8012
Panel C: Child's BMI						
Mother's BMI	0.385[c]	0.408[c]	0.412[c]	0.575[c]	0.537[c]	0.452[c]
	(0.052)	(0.055)	(0.052)	(0.082)	(0.082)	(0.090)
Low Income Quartile	0.355	0.354	0.358	−0.286	−0.321	−0.418
	(0.409)	(0.407)	(0.407)	(0.697)	(0.707)	(0.726)
Mother's Education	−0.450[c]	−0.437[c]	−0.410[c]	−0.332[a]	−0.294	−0.292
in 1979	(0.157)	(0.155)	(0.154)	(0.194)	(0.202)	(0.216)
Married in 1979	−0.942	−0.973	−0.965	−2.640[c]	−2.146[b]	−1.755[a]
	(1.563)	(1.587)	(1.583)	(0.991)	(1.043)	(1.055)
R^2	0.159	0.162	0.169	0.262	0.241	0.225
N	1987	1987	1987	452	452	452
p-value for diff. btw. natives and immigrants				0.0488	0.1870	0.6966

Notes: Standard error are reported in parenthesis. Standard errors are clustered at the family level. Other controls include child's sex, race, and age, mother's race, whether household lives in an urban area and unemployment rate in the current residence for the first year in which the mother was interviewed. 2-year averages for mothers' health outcomes are obtained using data from 1981 and 1982. 3-years average analysis utilizes data from 1981, 1982, 1985 for mothers' generation. Each regression is weighted using the 2004 Young Adult Weights.

[a] = 0.10.
[b] = 0.05.
[c] = 0.01.

children's BMI. Grandparents' fixed effects models presented in column (3) of Table A2 also yield point estimates of the persistence coefficients that remain virtually unchanged for natives and immigrants, though standard error are somewhat higher.

To gain better understanding of the magnitude of the persistence coefficients presented in Table 3, we can compare them to recently estimated persistence coefficients in education. Hertz et al. (2007) obtain a persistent coefficient in education of 0.46 for the United States. This suggests that the persistence coefficient on individual's weight, height and BMI are similar or higher than the persistence coefficient of education. Given the well-established causal link between health and labor market success, our findings highlight the importance of parental health capital in transmitting health endowments to their children as well as in understanding the strong persistence in socioeconomic status across generations in the United States.

Assortative mating is another important factor contributing to strong intergenerational correlation in economic status and education, which could also explain intergenerational persistence in health status. Lam and Schoeni (1994) and Chadwick and Solon (2002) demonstrate the importance of assortative mating in understanding intergenerational mobility in economic status.[8] Chiappori et al. (2012) and Oreffice and Quintana-Domeque (2010) show that there is assortative mating in anthropometric measures, which could amplify the intergenerational persistence in health outcomes we estimate in our study. Unfortunately, we do not have information on father's health status, so we are unable to control for these in our specifications or corroborate if there is assortative mating in health status.

5.1.4. OLS results with averages

In Table 4 we include specifications with the average health status of the mother using data for several years in order to reduce measurement error in the mother's yearly health outcomes.

[8] Solon (2004) explains that assortative mating is one way in which social behavior can interact with purely genetic traits to exacerbate intergenerational persistence. Solon (2004) develops a model to study the determinant of steady state intergenerational income mobility in the United States. He finds that the strength of the "mechanical" (for example, genetic) transmission of income-generating traits; the efficacy of investment in children's human capital; the earnings return to human capital, and the progressivity of public investment in children's human capital are main determinants of the persistence coefficient.

Table 5
Intergenerational Transmission of Asthma and Depression.

	Children of Native-Born			Children of Immigrants		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Asthma						
Mother has Asthma	0.170[c]	0.176[c]	0.173[c]	0.220[c]	0.216[c]	0.255[c]
	(0.029)	(0.031)	(0.045)	(0.055)	(0.058)	(0.086)
Low Income Quantile			0.002			0.067
			(0.026)			(0.064)
Mother's Education			−0.004			−0.003
in 1979			(0.011)			(0.014)
Married in 1979			0.021			0.043
			(0.085)			(0.094)
R^2	0.024	0.033	0.036	0.039	0.086	0.116
N	3785	3395	1998	924	858	497
p-value for diff. btw. natives and immigrants				0.4249	0.5368	0.3957
Panel B: Depression						
Mother is Depressed	0.081[c]	0.076[c]	0.086[c]	0.011	0.015	0.003
	(0.018)	(0.019)	(0.025)	(0.035)	(0.035)	(0.050)
Low Income Quartile			−0.019			−0.035
			(0.029)			(0.048)
Mother's Education			−0.018[a]			−0.019
in 1979			(0.011)			(0.017)
Married in 1979			−0.074			−0.090
			(0.066)			(0.082)
R^2	0.008	0.044	0.042	0.000	0.083	0.106
N	3957	3538	2082	961	893	510
p-value for diff. btw. natives and immigrants				0.0779	0.1237	0.1318
Child's Age, Sex and Race		Yes	Yes		Yes	Yes
Household Characteristics			Yes			Yes

Notes: Standard error are reported in parenthesis. Standard errors are clustered at the family level. Household characteristics include: mother's race, age, total household income, mother's marital status, whether household lived in urban area and unemployment rate in current residence for the first year in which the mother was interviewed. In Panel A, each column is from a separate regression using 2004 for mothers and young adults. In Panel B, data from 1992 is used for mothers and from 2004 for young adults. Each regression is weighted using 2004 Young Adult Weights.
[a] = 0.10.
[c] = 0.01.

Similar to earnings, averaging mother's health status should improve the ratio of signal to total variance, thus reducing the extent of error-in-variables bias (Solon, 1992; Zimmerman, 1992). Results are presented using children's health outcomes in 2004 and two- and three-year averages for mothers' health status. We utilize data from 1981 and 1982 for mothers' health outcomes when we present 2-years averages and data from 1981, 1982 and 1985 for 3-years averages.[9] The estimates corresponding to three-year averages of mother's health status are 0.455 for weight, 0.424 for height, and 0.412 for BMI among natives. Overall, the persistence coefficients for natives increase, as we average over more years for all health outcomes. Therefore, comparison of estimates using single year measures for mother's health outcomes with those averaging mother's health status over two and three years clearly suggests that measurement error is indeed a problem for natives. Therefore, accounting for error-in-variables will increase the persistence of health status across generations. On the other hand, for immigrants we find increased persistence merely for height when we use two- and three-year averages of mother's health status.

5.2. Intergenerational persistence of asthma and depression

We only observe whether mothers were ever diagnosed with asthma in 2004 and whether they experienced depression as early as 1992. Although we are not able to capture mother-child pairs exactly at the same point in their lifecycle when we focus on asthma and depression, we still believe that it is worthwhile to conduct these analyses to quantify to what extent children's specific health conditions and mental health are influenced by the attributes of the mother.

5.2.1. Intergenerational transmission of asthma

Studies of intergenerational transmission of health have been generally focused on special diseases such as cancer and Alzheimer's to understand the association between genes and specific diseases (Ahlburg, 1998). In this paper, we instead analyze the intergenerational transmission of asthma to assess to what extent this highly prevalent disease is being transmitted over generations. Panel A of Table 5 reports persistence coefficients for asthma condition. The point estimates on a mother having asthma indicate that the intergenerational associations between mother's incidence of asthma and a child's incidence of asthma is approximately 17% for children of natives and 22% for children of immigrants, although these persistence coefficients are not significantly different from each other.

5.2.2. Intergenerational transmission of depression status

Having shown that there is indeed a lot of persistence in physical health measures including weight, height, BMI and asthma, we will now describe the results for a mental health outcome, depression. In this analysis, we utilize information from 1992 for mothers and information from 2004 for children. The estimation results for depression are presented in Panel B of Table 5. We find that if a native mother reported being depressed in 1992, her children are also, on average, 8% points likely to feel depressed in 2004 compared to children of non-depressed mothers, suggesting intergenerational transmission of mental health across generations. By contrast, there is no evidence of any intergenerational transmission of depression among immigrants. The higher persistence for natives than immigrants is significant

[9] We utilize data from 1985 when we present 3-year averages, as data on anthropometric measures are not reported in 1983 and 1984 for the entire sample.

(p-value of 0.07). We also find that children of less educated mothers are more susceptible to depression, while other household characteristics seem to be unrelated to depression.

5.3. Intergenerational persistence of health for different immigrant generations

It is well documented that immigrants in a number of host countries around the world including the U.S., Canada and Australia have better health outcomes than their native counterparts with the same socioeconomic characteristics. This phenomenon is known in the U.S. as the "Hispanic paradox" and more generally as the "immigrant epidemiological paradox" (Baker et al., 2015; Akresh and Frank, 2008; Antecol and Bedard, 2006; McDonald and Kennedy, 2004; Stephen et al., 1994). However, studies also find that acculturation engenders the loss of strong family support networks, an increase in risky behavior and a change towards less healthy diets, impairing the health advantages of immigrants over time (Jasso et al., 2004; Akresh, 2007). This may imply that immigrants' health outcomes may resemble less their parents' as they stay longer in the U.S., and may be influenced more by the norms and attitudes in the host country. Thus, in our paper, we estimate the persistence coefficient in health across immigrants from different generations to investigate how the transmission of health from parents to children evolves as immigrants stay in the U.S. for more generations.

Tables 6 and 7 show results of intergenerational persistence in anthropometric health measures, asthma and depression for first, second, and third generation immigrant children to quantify whether persistence in health outcomes changes as immigrants stay in the U.S. longer. Importantly, in these analyses, we control for ethnic origin as well as the aforementioned controls to account for potential differences in the composition of immigrant groups over time.[10] The results show that persistence coefficients in weight and BMI are smaller for the third generation immigrant children than for first and second-generation immigrant children.[11] Thus, as immigrants remain longer in the U.S., they resemble less their mothers' weights and BMI's and these anthropometric measures instead depend more on other factors. In fact, third generation children show a tendency to resemble native children. As shown, in Table 1, third generation immigrant children look more similar to native children. The tendency towards higher weight and BMI are, however, not necessarily positive since these make immigrant children more likely to be overweight.

Table A3 shows results from pooled regressions that include natives and immigrants of various generations to examine if third generation immigrant children resemble natives more than second and first generation immigrants in terms of persistence of health from their mother's and their own health outcomes. The results show that the persistence coefficient for weight, BMI and asthma is smaller for third generation children compared to first and second-generation immigrant children. This result indicates that third generation immigrant children resemble their mothers less than first/second generation immigrant children in terms of BMI (significant at the 10% level). Moreover, immigrants have lower weight; height and BMI compared to natives, but third generation immigrants have higher weight and BMI than first/second generation immigrants though only the BMI difference is marginally significant (p-value of 0.126).[12] Thus, there is some evidence of assimilation in BMI as third generation immigrants are more like natives in terms of their BMI than first and second generation immigrants.

We further consider the potential heterogeneity in intergenerational persistence of health across immigrant groups with different socioeconomic status in Table A4. On the one hand, immigrants from relatively poor countries may have experienced an improvement in their health outcomes after migration with better nutrition, sanitation and healthier environment in general. However, these immigrants may also have limited access to healthcare in the U.S., leaving them susceptible to risky health behavior, which would lead to a higher BMI. On the other

Table 6
Intergenerational Transmission of Anthropometric Measures across Immigrant Generations.

		Children of		
	All (1)	First Gen. (2)	Second Gen. (3)	Third Gen. (4)
Panel A: Child's Weight				
Mother's Weight	0.537[c]	0.582[c]	0.524[c]	0.387[c]
	(0.081)	(0.139)	(0.133)	(0.089)
R^2	0.416	0.414	0.336	0.483
N	806	298	233	275
Panel B: Child's Height				
Mother's Height	0.494c	0.504[c]	0.303[b]	0.621[c]
	(0.059)	(0.099)	(0.120)	(0.099)
R^2	0.584	0.659	0.528	0.640
N	832	310	241	281
Panel C: Child's BMI				
Mother's BMI	0.398[c]	0.521[c]	0.510[c]	0.329[c]
	(0.062)	(0.155)	(0.079)	(0.067)
R^2	0.251	0.258	0.26	0.36
N	785	281	230	274

Notes: Standard errors are reported in parenthesis. Standard errors are clustered at the family level. Other controls include child's sex, age, and race, mother's age and ethnic origin. Each regression is weighted using the 2004 Young Adult Weights.
[b] = 0.05.
[c] = 0.01.

Table 7
Intergenerational Transmission of Asthma and Depression across Immigrant Generations.

		Children of		
	All (1)	First Gen. (2)	Second Gen. (3)	Third Gen. (4)
Panel A: Asthma				
Mother has Asthma	0.220[c]	0.082	0.324[c]	0.146[a]
	(0.055)	(0.094)	(0.084)	(0.081)
R^2	0.144	0.178	0.325	0.222
N	858	339	235	284
Panel B: Depression				
Mother is Depressed	0.040	0.113	0.026	0.036
	(0.045)	(0.074)	(0.088)	(0.077)
R^2	0.081	0.165	0.205	0.106
N	869	348	240	281

Notes: Standard errors are reported in parenthesis. Standard errors are clustered at the family level. Other controls include child's sex, age, and race, mother's age and ethnic origin. Each regression is weighted using the 2004 Young Adult Weights.
[a] = 0.10.
[c] = 0.01.

[10] More specifically, utilizing the question on respondents' origin or descent in NLSY79, we include dummies for African, Chinese, English, Filipino, German, Hawaiian, Native American, Asian Indian, Irish, Italian, Japanese, Korean, Cuban, Mexican, Puerto Rican, other Hispanics, Polish, Portuguese, Russian, Scottish, Vietnamese, and Welsh.

[11] Interestingly, the persistence coefficients for height in Panel B of Table 6 do not show these same patterns. Similarly, the results for asthma in Table 7 do not show a clear change in the persistence coefficients.

[12] By contrast, third generation immigrant children resemble their parents more in height and their height is farther away from the height of natives than those of first/s generation children and these differences are significant.

hand, high skill immigrants would likely have access to adequate healthcare in the U.S. and may not acquire a 'risky profile' in terms of excess BMI. To explore whether the persistence coefficient in health outcomes varies across immigrant groups with different socioeconomic status, in Table A4, we present the persistence coefficient for children whose household income is in the top quartile and for children whose household income is in the bottom quartile. We find that immigrant children with lower socioeconomic status inherit a larger fraction of their health status from their parents compared to immigrant children with higher socioeconomic status. Thus, these results do show higher persistence among immigrant children of low socioeconomic status. However, the results show that if anything it is higher income children, rather than the lower income children, who resemble more their native counterparts. While higher income children may have access to health care, it may be that lower income children experience less acculturation and keep closer to their traditions and their home-country diets and habits.

6. Conclusion

In this study, we use National Longitudinal Survey of Youth to investigate the extent of intergenerational correlation in health separately for natives and immigrants. We provide new evidence on intergenerational transmission of health status across generations. We find that both native and immigrant children inherit anthropometric health measures such as weight, height and BMI from their mothers. We also find that children's health conditions such as asthma and mental health conditions such as depression are, to a great extent, also inherited from their mothers. These high associations in health outcomes of mothers and children persist even when a rich set of controls, including children's and mothers' characteristics and grandparents' fixed effects are introduced into the models. In addition, we find that persistence in BMI is higher for immigrant children than for native children.

Finally, we find evidence of immigrant assimilation in health as immigrants remain for more generations in the U.S. The intergenerational persistence coefficient decreases for third generation immigrant children compared to first and second generation immigrant children. This indicates that the longer immigrant families remain in the U.S., the less likely immigrant children's health outcomes are to look like their mothers'. Moreover, we find some evidence that higher generation immigrant children are more likely to resemble native children in terms of higher BMI.

Appendix A.

See Tables A1–A4.

Table A1
Intergenerational Transmission of Health Outcomes.

	Children of Native-Born		Children of Immigrants	
	(1)	(2)	(3)	(4)
Panel A: Weight				
Mother's Weight	0.443[c]	0.425[c]	0.460[c]	0.477[c]
	(0.059)	(0.055)	(0.111)	(0.092)
R^2	0.061	0.237	0.058	0.372
N	2068	2068	488	488
Panel B: Height				
Mother's Height	0.359[c]	0.396[c]	0.366[c]	0.393[c]
	(0.041)	(0.029)	(0.092)	(0.072)
R^2	0.054	0.545	0.051	0.537
N	2087	2087	488	488
Panel C: BMI				
Mother's BMI	0.436[c]	0.388[c]	0.552[c]	0.532[c]
	(0.046)	(0.049)	(0.079)	(0.088)
R^2	0.085	0.146	0.131	0.235
N	2052	2052	479	479
Panel D: Asthma				
Mother has Asthma	0.176[c]	0.177[c]	0.261[c]	0.262[c]
	(0.044)	(0.045)	(0.099)	(0.087)
R^2	0.023	0.034	0.054	0.108
N	1998	1998	497	497
Panel E: Depression				
Mother is Depressed	0.090[c]	0.089[c]	0.011	0.003
	(0.026)	(0.025)	(0.052)	(0.050)
R^2	0.010	0.039	0.000	0.100
N	2082	2082	510	510
Child's Age, Sex and Race		Yes		Yes

Notes: Standard error are reported in parenthesis. Standard errors are clustered at the family level. Individuals with missing individual and mother's background characteristics are dropped from the analyses. Each regression is weighted using the 2004 Young Adult Weights.
[c] = 0.01.

Table A2
Persistence in Health Outcomes with Grandparents Fixed Effects.

	Weight (1)	Height (2)	BMI (3)	Asthma (4)	Depression (5)
Panel A: Children of Natives					
Mother's Health Outcome	0.280[a]	0.348[c]	0.281[a]	0.141	0.089
	(0.151)	(0.082)	(0.144)	(0.112)	(0.075)
Female	−29.052[c]	−5.581[c]	−0.337	−0.016	0.097[c]
	(2.004)	(0.157)	(0.291)	(0.023)	(0.028)
Age	3.531[c]	0.146[c]	0.427[c]	−0.001	0.008[a]
	(0.340)	(0.027)	(0.048)	(0.004)	(0.004)
R^2	0.728	0.823	0.678	0.598	0.566
N	3508	3539	3487	3395	3538
Panel B: Children of Immigrants					
Mother's Health Outcome	0.164	0.437	0.192	0.537[a]	−0.024
	(0.425)	(0.268)	(0.441)	(0.322)	(0.101)
Female	−32.588[c]	−5.427[c]	−1.057[b]	−0.020	0.037
	(3.479)	(0.345)	(0.515)	(0.047)	(0.062)
Age	1.935[c]	0.090	0.239[c]	−0.004	0.006
	(0.675)	(0.058)	(0.089)	(0.007)	(0.009)
R^2	0.795	0.849	0.719	0.672	0.582
N	850	852	835	858	893

Notes: Standard error are reported in parenthesis. Standard errors are clustered at the family level. Each column controls for child's sex, race and age and mother's age. Each regression is weighted using the 2004 Young Adult Weights.
[a] = 0.10.
[b] = 0.05.
[c] = 0.01.

Table A3
Intergenerational Transmission of Health across Immigrant Generations, Pooled Regression.

	Weight (1)	Height (2)	BMI (3)	Asthma (4)	Depression (5)
Mother's Health Outcome	0.513[c]	0.373[c]	0.485[c]	0.252[c]	0.057
X First Gen and Second Gen.	(0.084)	(0.070)	(0.073)	(0.085)	(0.055)
Mother's Health Outcome	0.434[c]	0.607[c]	0.333[c]	0.220[b]	0.011
X Third Gen.	(0.092)	(0.087)	(0.062)	(0.088)	(0.064)
First Gen and Second Gen.	−69.310[c]	−24.110[c]	−11.205[c]	−0.034	−0.018
	(10.745)	(4.450)	(1.593)	(0.031)	(0.037)
Third Gen.	−58.795[c]	−38.785[c]	−7.961[c]	0.006	−0.042
	(12.093)	(5.724)	(1.408)	(0.032)	(0.036)
R^2	0.208	0.496	0.108	0.029	0.039
N	4194	4293	4142	4236	4123
p-value for diff. in persistence coefficients	0.5248	0.0343	0.1098	0.7962	0.5801
p-value for diff. across imm. generations	0.5136	0.0406	0.1263	0.3331	0.6142

Notes: Standard error are reported in parenthesis. Standard errors are clustered at the family level. Each column controls for child's sex, race and age and mother's age and ethnic origin. Each regression is weighted using the 2004 Young Adult Weights. a = 0.10.
[b] = 0.05.
[c] = 0.01.

Table A4
Heterogeneity by Household Income among Immigrants.

	Weight (1)	Height (2)	BMI (3)	Asthma (4)	Depression (5)
All	0.488[c]	0.387[c]	0.538[c]	0.217[c]	0.003
	(0.089)	(0.074)	(0.081)	(0.077)	(0.050)
Top Quartile	0.252	0.337[b]	0.299[b]	0.026	−0.170
	(0.182)	(0.141)	(0.137)	(0.072)	(0.109)
Lowest Quartile	0.354[b]	0.403[b]	0.459[b]	0.406[c]	0.062
	(0.159)	(0.156)	(0.177)	(0.135)	(0.081)

Notes: Standard error are reported in parenthesis. Standard errors are clustered at the family level. Each column controls for mother's education and marital status, age, urban residence, unemployment rate in current residence for the first year in which the mother was interviewed, and child's age, sex and race. Each regression is weighted using 2004 Young Adult Weights. a = 0.10.
[b] = 0.05.
[c] = 0.01.

References

Ahlburg, Dennis, 1998. Intergenerational transmission of health. Am. Econ. Rev. Pap. Proc. 88 (2), 265–270.

Akresh, Ilana Redstone, Frank, Reanne, 2008. Health selection among new immigrants. Am. J. Public Health 98 (11), 2058–2064.

Akresh, Ilana Redstone, 2007. Dietary assimilation and health among hispanic immigrants to the United States. J. Health Soc. Behav. 48 (4), 404–417.

Antecol, Heather, Bedard, Kelly, 2006. Unhealthy assimilation: why do immigrants converge to American health status levels? Demography 43 (2), 337–360.

Baker, Elizabeth, Rendal, Michael, Weden, Margaret, 2015. Epidemiological paradox or immigrant vulnerability? Obesity among young children of immigrants. Demography 52 (4), 1295–1320.

Behrman, Jere, Rosenzweig, Mark, Taubman, Paul, 1994. Endowments and the allocation of schooling in the family and in the marriage market: the twins experiment. J. Polit. Econ. 6 (102), 1131–1174.

Black, Sandra, Devereux, Paul, Kjell, G. Salvanes, 2007. From the cradle to the labor market? The effect of birth weight on adult outcomes. Q. J. Econ. 122 (1), 409–439.

Borjas, J. George, 1992. Ethnic capital and intergenerational mobility. Q. J. Econ. 107 (1), 123–150.

Bozzoli, Carlos, Deaton, Angus, Quintana-Domeque, Climent, 2009. Adult height and childhood disease. Demography 46 (4), 647–669.

Burkhauser, Richard, Cawley, John, 2008. Beyond BMI: the value of more accurate measures of fatness and obesity in social science research. J. Health Econ. 27 (2), 519–529.

Case, Anne, Paxson, Christina, 2008. "Stature and status: height, ability, and labor market outcomes.". J. Polit. Econ. 116 (3), 499–532.

Case, Anne, Fertig, Angela, Paxson, Christina, 2005. The lasting impact of childhood health and circumstance. J. Health Econ. 24 (2), 365–389.

Cawley, John, 2004. Body weight and women's labor market outcomes. J. Hum. Resour. 39 (2), 451–474.

Chadwick, Laura, Solon, Gary, 2002. Intergenerational income mobility among daughters. Am. Econ. Rev. 92 (1), 335–344.

Chetty, Raj, Hendren, Nathaniel, Kline, Patrick, Saez, Emmanuel, 2014. Where is the land of opportunity? The geography of intergenerational mobility in the United States. Q. J. Econ. 129 (4), 1553–1623.

Chiappori, Pierre-Andrè, Oreffice, Sonia, Quintana-Domeque, Climent, 2012. Fatter attraction: anthropometric and socioeconomic matching on the marriage market. J. Polit. Econ. 120 (4), 659–695.

Classen, Timothy, 2010. Measures of the intergenerational transmission of body mass index between mothers and their children in the United States. Econ. Hum. Biol. 8 (1), 30–43.

Collins, James, Wu, Shou-Yien, David, Richard, 2002. Differing intergenerational birth weights among the descendants of U.S.-born and foreign-born whites and African Americans in Illinois. Am. J. Epidemiol. 155 (3), 210–216.

Coneus, Katja, Spiess, Katharina, 2012. The intergenerational transmission of health in early childhood: evidence from the German socio-economic panel study. Econ. Hum. Biol. 10 (1), 89–97.

Corak, Miles, 2004. Generational Income Mobility in North America and Europe. Cambridge University Press, Cambridge.

Currie, Janet, Madrian, Brigitte, 1999. Health, health insurance and the labor market. In: Ashenfelter, O., Card, D. (Eds.), Handbook in Labor Economics, vol. 3. Elsevier, Amsterdam, pp. 3309–3415.

Currie, Janet, Moretti, Enrico, 2003. Mother's education and the intergenerational transmission of human capital: evidence from college openings. Q. J. Econ. 118 (4), 1495–1532.

Currie, Janet, Moretti, Enrico, 2007. Biology as destiny? Short and long-run determinants of intergenerational transmission of birth weight. J. Labor Econ. 25 (2), 231–264.

Dolton, Peter, Xiao, Mimi, 2015. The intergenerational transmission of BMI in China. Econ. Hum. Biol. 19, 90–113.

Elo, Prina, Neil Mehta and Cheng Huang, 2008. Health of Native-born and Foreign-born Residents in the United States: Evidence from the 2000 Census of Population and the National Health Interview Survey. PARC Working Paper Series, WPS 08–04.

Emanuel, Irvin, Filakti, Haroula, Alberman, Eva, Evans, Stephen, 1992. Intergenerational studies of human birth weight from the 1958 birth cohort. 1. Evidence for a multigenerational effect. Br. J. Obstet. Gynaecol. 99 (1), 67–74.

Eriksson, Tor, Bernt, Bratsberg, Oddbjorn, Raaum, 2005. Earnings Persistence Across Generations: Transmission Through Health? Oslo University, Department of Economics (Unpublished Manuscript).

Ferrie, Joseph, 2005. The end of american exceptionalism? Mobility in the United States since 1850. J. Econ. Perspect. 19 (3), 199–215.

Fogel, Robert, 1992. Second thoughts on the european escape from hunger: famines, chronic malnutrition and mortality rates. In: Osmani, S.R. (Ed.), Nutrition and Poverty. Clarendon, Oxford, pp. 243–286.

Frank, Reanne, Akresh, Ilana Redstone, 2013. Social patterning in body mass index (BMI) among contemporary immigrant groups: the emergence of a gradient. Demography 50, 993–1012.

Garcia, Jaume, Quintana-Domeque, Climent, 2007. Obesity, employment, and wages in europe. In: Bolin, K., Cawley, J. (Eds.), Advances in Health Economics and Health Services Research, vol. 17. Elsevier, Amsterdam, pp. 187–217 (The Economics of Obesity).

Grossman, Michael, 1972. On the concept of health capital and the demand for health. J. Polit. Econ. 80 (2), 223–255.

Hertz, Tom, Jayasundera, Tamara, Piraino, Patrizio, Selcuk, Sibel, Smith, Nicole, Verashchagina, Alina, 2007. The inheritance of educational inequality: international comparisons and fifty-year trends. B.E. J. Econ. Anal. Policy 7 (2), 1682–1935.

Jasso, Guillermina, Massey, Douglas, Rosenzweig, Mark, Smith, James, 2004. Immigrant health, selectivity and acculturation. In: Anderson, N.B., Bulatao, R. A., Cohen, B. (Eds.), Critical Perspectives on Racial and Ethnic Differences in Health in Late Life. National Academy Press, Washington, DC, pp. 227–266.

Judge, Timothy, Cable, Daniel, 2004. "The effect of physical height on workplace success and income: preliminary test of a theoretical model.". J. Appl. Psychol. 89 (1), 428–441.

Lam, David, Schoeni, Robert F., 1994. Family ties and labor markets in the United States and Brazil. J. Hum. Resour. 29 (4), 1235–1258.

McDonald, James Ted, Kennedy, Steven, 2004. "Insights into the 'Healthy immigrant effect': health status and health service use of immigrants to Canada.". Soc. Sci. Med. 59 (8), 1613–1627.

Mushkin, Selma J., 1962. Health as an investment. J. Polit. Econ. 70 (Part 2 (5)), 129–157.

Oreffice, Sonia, Quintana-Domeque, Climent, 2010. Anthropometry and socioeconomics among couples: evidence in the United States. Econ. Hum. Biol. 8 (3), 373–384.

Oreffice, Sonia, Quintana-Domeque, Climent, 2016. Beauty, body size and wages: evidence from a unique data set. Econ. Hum. Biol. 22, 24–34.

Persico, Nicola, Postlewaite, Andrew, Silverman, Dan, 2004. The effect of adolescent experience on labor market outcomes: the case of height. J. Polit. Econ. 112 (5), 1019–1053.

Silventoinen, Karri, 2003. Determinants of variation in adult body height. J. Biosoc. Sci. 35 (2), 263–285.

Solon, Gary, 1992. "Intergenerational income mobility in the United States". Am. Econ. Rev. 82 (3), 393–408.

Solon, Gary, 2004. A model of intergenerational mobility variation over time and place. In: Corak, Miles (Ed.), Generational Income Mobility in North America and Europe. Cambridge University Press, Cambridge, UK (Chapter 2).

Steckel, Richard, 1995. Stature and the standard of living. J. Econ. Lit. 33 (4), 1903–1940.

Stephen, Elizabeth Hervey, Foote, Karen, Hendershot, Gerry E., Schoenborn, Charlotte A., 1994. Health of the foreign-born population. Adv. Data Vital Health Stat. 241, 1–10.

Strauss, John, Thomas, Duncan, 1995. Human resources: empirical modeling of household and family decision. In: Behrman, J., Srinivasan, T.N. (Eds.), Handbook of Development Economics, vol. 3. Elsevier Science, Amsterdam.

Wada, Roy, Tekin, Erdal, 2010. Body composition and wages. Econ. Hum. Biol. 8 (2), 242–254.

Yan, Ji, 2015. "Maternal pre-pregnancy BMI, gestational weight gain, and infant birth weight: a within-family analysis in the United States.". Econ. Hum. Biol. 18, 1–12.

Yuksel, Mutlu, 2007. Intergenerational Mobility of Immigrants in Germany: Moving with Natives or Stuck in their Neighborhoods? IZA Working Paper No. 4677.

Zimmerman, Davi, 1992. Regression toward mediocrity in economic stature. Am. Econ. Rev. 82 (3), 409–429.